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ANIMAL BREEDING AND FEEDING INVESTIGATIONS BY THE BUREAU OF ANIMAL INDUSTRY.

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PLAN OF OPERATION.

One of the most noteworthy undertakings of the Bureau of Animal Industry during recent years is the inauguration of investigations in animal breeding and feeding in cooperation with the State agricultural experiment stations. At the second session of the Fifty-eighth Congress a fund of \$25,000 was appropriated for this purpose, and plans were at once begun to carry out the purposes of the act. Four general sections were considered in locating the work—the West, the Central States, the East, and the South—and problems are now being worked out in all but the Central West, where investigations will probably be commenced during the coming year.

In planning the work it has been decided to give special attention to problems in animal breeding, for several reasons. Animal breeding as a field for systematic research is not greatly affected by local conditions, and very few investigations have been undertaken by the experiment stations or the Department. The feeding of animals, on the other hand, is influenced by a very great variety of such conditions, and experiment stations, which have covered this field quite thoroughly, are constantly adding to our knowledge of the subject. Furthermore, investigations in animal breeding require resources that are at the command of few stations. In carrying out the provisions of the act in question regarding experiments in animal feeding, some work will be done in practical feeding under local conditions, but the principal lines of research of this nature may be confined, it is hoped, to scientific investigation of the principles of nutrition.

The stations with which the Department is cooperating are the Pennsylvania experiment station in animal nutrition, the Iowa experiment station in sheep breeding, the Maine experiment station in poultry breeding, the Colorado experiment station in horse breeding, the Alabama experiment station in beef and pork production, and the Texas experiment station in feeding beef cattle. These problems were selected as being urgent ones, and the locations give the work a representative character.

In carrying out the provisions of this act and making agreements with the different experiment stations, the Department has arranged in a general way for a division of expense, which will make the station

financially interested in the success of the work, and will give a reasonable return for the assistance it receives. It has sometimes been necessary, however, for the Department to contribute a larger sum of money than the station was able to provide, for the reason that most of these institutions had made arrangements for the expenditure of all available funds for several years ahead, and to ask them to contribute a sum of money equal to that which the Government could provide would cripple them financially or entirely preclude their entering into cooperation for this purpose. However, it must be recognized as a great advantage that stations have connected with them trained men familiar with the conditions of their States, whose ability to conduct the work on the ground is an invaluable asset which could be obtained only by liberal arrangements on the part of the Department.

ANIMAL NUTRITION.

Cooperation was established several years ago with the Pennsylvania experiment station to start systematic investigations in animal nutrition. A respiration calorimeter, modeled on that erected by Professors Atwater and Rosa for the study of human nutrition and adapted for use with animals, has been installed. A large amount of material has been gathered, and the results of the first series of investigations on the available energy of timothy hay have been published as Bulletin No. 51 of the Bureau of Animal Industry. These investigations have been supplemented by an allowance from the cooperative breeding and feeding fund for investigations on the influence of age and individuality on the nutrition of animals. Two young steers have been purchased—one a purebred Aberdeen Angus, the other a purebred Jersey. It is intended to study their metabolism until maturity.

SHEEP BREEDING.

The Iowa experiment station has been selected as a point to begin the development of sheep more suitable to range conditions than those used at present. Under the conditions of the market the ideal range sheep should have three prominent characteristics; it should yield a profitable carcass, a good clip of wool, and should stand flocking in large numbers. Many of our breeds of sheep are valuable in two of these particulars, but none possesses all. If a breed can be developed which will fill all the requirements mentioned, it is believed that it will be of much value to sheepmen on the range. The Iowa station now has a small flock which it has built up by crossing and selection, and hopes in a few years to have fixed the type so that the sheep may be tested under range conditions.

POULTRY BREEDING.

The Maine experiment station has been making a special study of poultry breeding for several years, and the Department is now assisting in this work. The object of the investigation is twofold—the

development of strains which will lay 200 eggs annually per hen and the study of the amount of floor space required per fowl. The production of a hen which will lay 200 eggs in one year is an accomplished fact, but when this is done it usually happens that in the succeeding year the egg yield is very greatly diminished, and in some cases the hens have died, apparently from exhaustion. The point has not yet been reached where a family can be depended upon to produce hens which will lay 200 eggs year after year, though this may be accomplished in time; nevertheless, the development of a family which may be depended upon to produce 200 eggs per bird during the first laying year is a distinct advance and of much value. The study of floor-space requirements in connection with this work is an allied field of investigation made possible by the erection of a new poultry house, the fowls being kept in pens of different sizes.

HORSE BREEDING.

Horse breeding is the most important line of work in animal breeding which the Bureau has undertaken, and it will be discussed in considerable detail.

INCREASE OF PRICES AND SCARCITY OF HORSES.

The situation in the horse market during recent years has had a great deal to do with determining the lines of work to be undertaken in this respect. From the years 1899 to 1904, inclusive, there has been an increase, ranging from \$10 to \$35, in the average prices for all classes of horses on the Chicago market, as shown by the following table:

Increase in prices of horses on the Chicago market, 1899-1904.

Class.	Range of prices.		Increase.
	1899.	1904.	
Drafters	\$155	\$177	\$22
Carriage pairs	410	475	65
Drivers	140	150	10
Horses for general use	105	140	35
Bussers and trammers	115	140	25
Saddlers	150	160	10
Southern chunks	50	64	14

^a Increase per pair.

This table shows what always happens during a period of scarcity, namely, a large increase in the prices of the best grades, the average price of carriage horses increasing \$32.50 per head; but there is one very remarkable feature in the large increase in the prices of the cheaper grades. Horses for general use show the largest increase of any, \$35 per head; bussers and trammers have increased \$25 per head; and Southern chunks \$14 per head. The relative increase in these cheap classes has been greater than that of the better ones, and the fact shows clearly that the demand for horses has rapidly increased.

This situation causes a tone approaching that of alarm to pervade the horse market, and, while they are always inclined to bear the market, dealers seem to have good reason for concern in this instance. The conditions on the Chicago market are a good indication of those for the entire country.

RELATION OF THE EXPORT TRADE TO THE HORSE MARKET.

The relation of the export trade to the horse market is peculiar. The Columbian Exposition at Chicago marked the beginning of a very strong demand from Europe for American horses, and export buyers were soon prominent on the market, with the result that prices advanced rapidly. The condition of this trade during the past decade is shown by the following table:

Domestic exports of horses of the United States, 1895-1904.

Year ended June 30—	Number.	Value.
1895	13, 984	\$2, 209, 298
1896	25, 126	3, 530, 703
1897	39, 532	4, 769, 265
1898	51, 150	6, 176, 569
1899	45, 778	5, 444, 342
1900	64, 722	7, 612, 616
1901	82, 250	8, 873, 845
1902	103, 020	10, 048, 046
1903	34, 007	3, 152, 159
1904	42, 001	3, 189, 109

The great increase from 1900 to 1902 is due to the exportations to South Africa, which have now almost entirely stopped.

It will be observed that the number of horses exported is still normal. This, however, is due to the increase in the exports to British North America and the West Indies. There is also a strong demand from Mexico. The trade with the United Kingdom (our heaviest European purchaser) fell during 1904 to a lower point than in any year in the last decade, and the exports to British North America may be accounted for by the large agricultural emigration to Canada during recent years.

The following table shows the exports to the United Kingdom and British North America. The European demand for our horses was soon followed by rapid improvement in business conditions in this country, and this resulted in a very greatly increased domestic demand for horses, with the rise in prices already mentioned. This advance has caused the falling off in exports to Europe; where we were sending several thousand each month we are now sending hundreds, and export buyers have either returned home or engaged in the domestic trade in the United States.

Domestic exports of horses of the United States to the United Kingdom and British North America, 1895-1904.

Year ended June 30—	United Kingdom.		British North America.	
	Number.	Value.	Number.	Value.
1895.....	5,834	\$952,532	4,493	\$710,727
1896.....	12,022	1,776,600	5,683	693,639
1897.....	19,350	2,579,736	3,902	473,574
1898.....	22,129	3,072,498	9,415	874,674
1899.....	20,934	3,024,952	10,088	667,165
1900.....	30,232	4,205,376	8,830	857,206
1901.....	22,698	3,481,467	9,305	863,631
1902.....	10,015	1,593,340	23,183	1,808,298
1903.....	3,755	688,940	24,965	2,121,864
1904.....	2,325	412,760	24,686	2,099,985

For the horse breeder the continuation of this trade is a favorable state of affairs, for the reason that if the home market is threatened with overproduction an outlet by means of exportation can readily be obtained. The reputation of American horses abroad is thoroughly established, and if prices fall again foreign buyers will no doubt soon appear and the surplus will be absorbed.

MEANS OF RELIEF.

The present shortage may be relieved by two means: First, by the direct importation of breeding animals from foreign countries in larger numbers than before; second, by developing new breeds from our own stock or by improving those which already exist. To a great many unprejudiced observers it has seemed that the most advisable method would be the former, and they would urge breeders to take the established types on the other side of the Atlantic and transplant them in large numbers to this country, using the argument that we have a present crisis to meet and that we should not consider seriously a long-time proposition which would benefit only the grandchildren of the present generation.

While the Department recognizes the strength of these arguments, it believes that the second plan is the more practical one and will result in greater permanence and more lasting benefit to the horse industry than the former; and that the expense and the length of time required will not be so great as some have anticipated if the enterprise is properly managed. Further, it may be seriously questioned whether the supply of good breeding animals in foreign countries will permit the drafts upon it necessary to bring our horses to the required standard and meet the present emergency.

THE TROTTER AS A FOUNDATION FOR AN AMERICAN BREED OF HORSES.

In the countries of the world where horse breeding has been encouraged by government assistance, the foundation has been native stock, and the key to successful work has been selection according to a certain type. Furthermore, with all due respect to Godolphin Arabian,

the Darley Arabian, and their contemporaries, the great factor in developing the Thoroughbred horse was the method of the English breeder, and more credit is due to native English stock and to environment than has generally been acknowledged.

What the Thoroughbred horse is to the Englishman, the trotting horse is to the American; the breeds are the national horses of their respective countries, and, as the Thoroughbred has been the great leavening power in developing English breeds of light horses, the trotter may bear the same relation to the horse stock of America.

The trotter is found throughout the country wherever horses are raised, and any improvement in this breed affects in time the entire horse industry. The light market classes can be supplied from this source, and there is no more effective way to provide a supply of suitable cavalry horses for the United States Army than by showing how the native horse may be improved.

That the trotter has faults no one will deny, and that the speed idea has been responsible for many of these faults, and has caused many a man to become bankrupt, is equally certain. If a horse can trot in 2:10 or better, it is reasonably certain that he will make his owner money, and it matters not how homely or unsound he may be; but if the horse has bad looks and unsoundness, and also lacks speed, he will be unprofitable on the track and can not be sold at a profitable price on the market; while, if used in the stud, his undesirable qualities are perpetuated. On the other hand, if the horse has moderate speed, but is sound, handsome, and stylish, with a shapely head and neck, a straight, strong back, straight croup, muscular quarters and stifles, well-set legs, possesses good all-round true action, and has abundant endurance, he is almost certainly a profitable investment. This is the kind of light horse which the market wants and will pay for. If of the roadster type, he sells well as a driver; if more on the heavy harness order, as a carriage horse.

The occurrence of trotting-bred horses of the finest conformation is by no means uncommon; it is so frequent indeed that these animals supply not only the demand for roadsters, but the principal part of the fine city trade in carriage horses, and are conspicuous winners at the horse shows. The demand for such horses has been so keen that dealers have resorted to the pernicious practice of buying mature stallions, many of them valuable breeders, and castrating them to be sold later as carriage horses. The famous Lord Brilliant, three-times winner of the Waldorf-Astoria gig cup at Madison Square Garden, is a notable instance of this practice; Lonzie, a noted Chicago show horse, is another; and the horse purchased for the Department experiments narrowly escaped the same fate. This practice can not be too strongly condemned. There is reason to believe that if these stallions were used as the nucleus of a breed, the type would in time become fixed and their blood be saved to the country. On the other

hand, if steps are not taken to mold the blood of these horses into one breed and preserve the blood lines which produce them, an irreparable loss to the industry will result. The first step should be to select foundation stock strictly according to type; the next to study the lines of breeding which produce these horses. To a certain extent they are accidents of breeding, but there is little doubt that certain families show a greater tendency in this direction than others. For example, the descendants of Alexander's Abdallah, Harrison Chief, the Morgans, and the Clay family have been more or less notable in this respect. Further, certain sires are known to produce handsome and marketable horses with regularity.

EFFORTS OF DEPARTMENT FOR DEVELOPMENT OF A BREED OF CARRIAGE HORSES.

In view of these facts, the Department decided to undertake the development of a breed of carriage horses on an American foundation as an interesting and important problem for solution. If successful, it will show that we can develop our own breeding stock of horses in this country; it will make light horse breeding less of a lottery than it is at present, and will at the same time provide breeding animals which can be used profitably on the lighter horses of the country.

After a thorough search the Department has purchased as foundation stock eighteen mares and one stallion. In addition it can command the services of additional stallions if desired. The instructions of the purchasing board allowed considerable latitude, but it was required to select strictly according to type. Hereditary unsoundness was regarded as a disqualification. Pedigree was not considered so far as registration was concerned, but the board required evidence to be submitted showing that the animals purchased were from parents and ancestors of like type, thus insuring blood lines that would breed reasonably true. Speed, while not ignored, was not made an essential. Life, spirit, and energy, with moderate speed, were considered, and, while conformation was not sacrificed to speed, speed with conformation and good action was regarded as an advantage.

The type for mares was one standing about 15.3 hands, weighing 1,100 to 1,150 pounds, bay, brown, or chestnut in color, with stylish head and neck, full-made body, deep ribs, straight back, strong loin, straight, full croup, muscular forearms, quarters, and lower thighs; good all-round action was insisted upon. Any tendency to pace or mix gaits was regarded as ground for disqualification. In some cases, mares of more than 15.3 hands were purchased, and in others they were less than this. All, however, conformed closely to the type. Some of the mares are in foal; the rest will be bred during the spring of 1905.

The ancestors of six mares purchased in Wyoming have been bred for five or six generations in that State, the band having been started by means of an importation of horses from the Central West which

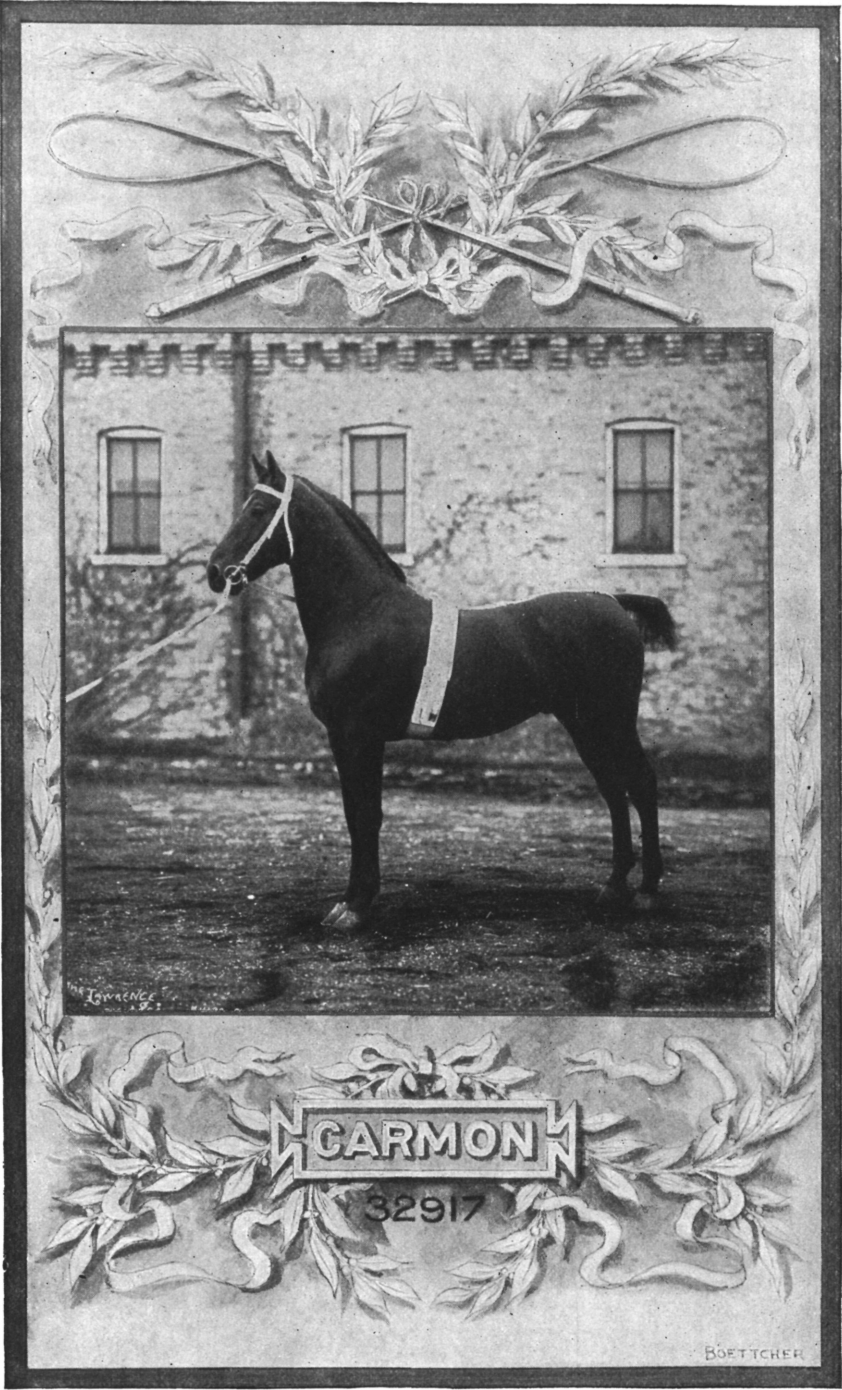
was largely of Morgan stock. On this stock Thoroughbred and standard sires have been used and the herd has been developed more to produce a horse suitable for carriage purposes than one which had speed characteristics. Some of the six have been exhibited at the New York horse show, and the owner of the ranch maintains a stable near New York City where he sends his surplus from year to year to be finished for the fine city trade.

The search for a stallion to head the stud was the most difficult of all. An almost unlimited number of trotting horses suitable to get good carriage horses were recommended to the Department, but on investigation it would be found that they were deficient in some respect and could not be considered. A horse was finally selected which was among the first suggested: Carmon 32917 American Trotting Register, 16 hands, weighing 1,200 pounds in fair condition, bay, with black points and no white markings, bred by Hon. Norman J. Colman, of St. Louis, Mo. This horse was exhibited by Mr. Thomas W. Lawson, of Boston, Mass., as one of his famous four-in-hand, under the name of "Glorious Thundercloud."

The points of Carmon's conformation which deserve special mention are his head and neck and hind quarters. His forehead is broad and full, with a straight nose and face; full, expressive eyes, and well carried ears. The neck is clean, muscular, and well arched. The illustration (Pl. LXXI) does not do him justice in these respects. In the hind quarters, special attention should be directed to the straight, broad croup and the muscular quarters and lower thighs. The horse has an abundance of bone and substance, but ample quality at the same time. His action is excellent.

A study of Carmon's pedigree (fig. 60) will show that it is not a particularly fashionable one from the standpoint of the man who is breeding solely for speed. This is a pedigree from which one might expect a horse of excellent conformation. Robert M'Gregor, for example, was a horse with especially well developed hind quarters, and this characteristic is seen in his sons and grandsons, as shown by Cresceus and Carmon. Abdallah 15 was a horse with a particularly attractive head and neck. The frequency with which the Abdallah cross appears in Carmon's pedigree, and the presence of Morgan, Mambrino Chief, and Clay blood readily explains where this horse gets his handsome head and neck and his full quarters and stifles. These families have produced some of our handsomest horses. Their blood makes up nineteen sixty-fourths of Carmon's pedigree.

The small percentage of pacing blood is worthy of particular notice. Further, the prominent trotting sires in it have produced more trotters than pacers, and Robert M'Gregor, Abdallah 15, and Ethan Allen are noteworthy for the very small number of pacers sired by them or produced by their sons and daughters. This is so small that they may be regarded strictly as sires of trotters. Abdallah 15 and Ethan Allen



THE FIRST SIRE SELECTED FOR USE IN THE EXPERIMENTS OF THE DEPARTMENT OF AGRICULTURE TO DEVELOP AN AMERICAN BREED OF CARRIAGE HORSES.

BEEF AND PORK PRODUCTION UNDER SOUTHERN CONDITIONS.

In cooperation with the Alabama experiment station, experiments are being inaugurated to study the economy of beef and pork production under southern conditions. The work will be directed along three general lines: (1) A feeding experiment with southern steers on southern feed; (2) the establishment of a herd of beef cattle; (3) pork production.

Fifty steers have been on feed during the past winter. They were selected from a herd of Alabama steers, in which there was considerable improved blood, and were fed to study the value of southern feeds in beef production. This experiment is intended to be a preparation for more extended work, which is contemplated in the future.

In the establishment of a herd of beef cattle about twenty cows will be purchased, and one purebred beef bull. The cows will have been bred in the South and will be immune from Texas fever; they will be grades of one of the beef breeds, if such animals are obtainable, in which case the bull will, of course, be of the same breed. These cattle will be placed on a farm leased for the purpose under the care of a competent man. The object of this work will be a demonstration of the advantages of grading up a herd for commercial purposes, and a study of the economy of such methods in the South. As in the horse-breeding work, the most rigid culling will be done, and the offspring will be fattened and sold from time to time.

The work in pork production has not yet been definitely decided upon, but will probably include among other things the study of the value of cassava in hog feeding. A crop of cassava and seed canes of cassava will be procured for this purpose.

It is worthy of note that the Alabama experiment station has turned its entire available fund for animal industry into this cooperation.

Plans have been perfected to cooperate with the Texas experiment station in feeding low-grade rice to cattle. In the rice-growing districts of the South there is a considerable loss each year from the fact that a certain percentage of the crop is unmarketable, owing to damage in harvesting or while in storage, which renders it undesirable for human food. The by-products of rice mills, such as rice polish and rice meal, have been found to have considerable value for feeding purposes, and it is thought that the rice grain itself may be even more valuable than the by-products. Further, if rice can be profitably fed to live stock it will provide for the consumption of any surplus which may exist, and thus the danger of overproduction may be avoided. This investigation will have an added interest to southern feeders, for the reason that one of the feeding problems in that section is to obtain an economical carbohydrate concentrate which can be used to supplement cotton-seed meal and nitrogenous roughage.

PROPOSED INVESTIGATIONS.

In addition to the foregoing work, negotiations are pending with other stations to conduct experiments during the present year, and to formulate plans for work to be started as soon as funds are available.

Plans are being discussed with the Iowa experiment station for experiments in the production of dual-purpose cattle. One of the problems of farmers in the Central West is to obtain cows which will produce milk and butter profitably for home consumption, and drop calves which, if desired, will make marketable beef. Under the diversified agriculture of that section, the farmer owns but a few cows. Special purpose dairy cows are regarded as unprofitable, because when their life in the dairy is completed their value for beef is not great; moreover, the veal industry is not extensive, and cattle feeders will not buy calves of the dairy breeds. Such calves must, therefore, be disposed of at a loss or killed at birth. It has been quite clearly demonstrated that a dairy-bred steer is not profitable for beef production, but it is by no means proved that a cow of beef type will not yield the farmer a satisfactory profit at the pail. Indeed, the evidence seems to indicate the reverse. During their history, various families of Shorthorns have been famous as milk and beef producers, and many cows possess these characteristics to-day. The tendency of breeders in the United States, however, is to abandon entirely the deep-milking characteristic, and to develop these animals solely as beef producers. Systematic efforts can prevent this loss of one of the valuable characteristics of the breed. The dual-purpose character is common to the Red Polled, the Polled Durham, and other breeds; the problem thus promises considerable success and has many interesting features. These investigations will not in the least endanger the status of the strictly dairy breeds. For the dairymen there is little doubt that the single-purpose breeds are most desirable, but for the general farmer, with a lack of adequate labor, who can not engage extensively in dairying, an entirely different animal appears to be needed.

OBJECT OF THE WORK.

Speaking broadly, the object of these experiments is the development of American breeding stock and the encouragement of a tendency to ultimate independence of foreign breeders. The Department believes that our tariff laws should always be liberal regarding the importation of the very highest types of breeding animals, whose use on our stock would result in unquestioned benefit, but it is of the opinion that the importing system is carried to an extreme at times and that in many cases animals are imported solely for speculation. As the system now stands it is an anomaly, especially in the case of horses. Attention is concentrated on the importation of stallions; mares are rarely bought. Now, these stallions have been bred up in Europe from the native

stock and the registration of animals bred in this way is still possible abroad; but when such horses are brought to this country their offspring are not eligible to registry unless out of registered dams, and registered dams are scarce, because so few mares are imported. In the case of the Percheron breed, for example, the studbooks are now closed to horses bred by crossing registered stallions on native mares. A system which leads to the importation of such horses is unfair to the American breeder and creates a monopoly in the hands of a few men who also have a certain amount of control over the studbooks.

A much more reasonable system has developed among cattle breeders. Large numbers of females have been imported and breeds were rapidly established. It is now claimed that as good Jerseys and Holsteins are bred in the United States as can be imported, and Hereford breeders have so adapted their breed to the peculiar conditions under which cattle are handled and have catered so successfully to the demands of the market that breeders no longer think of importing unless to get a particular line of breeding.

If the Department experiments in carriage-horse breeding are successful, it will be proof positive that we can develop breeds of light horses. If this can be done, we can also fix the types of draft horses now in the country.

As a broader problem, the study of animal breeding should be taken up to increase the efficiency of the breeds that are now established. Extensive investigations have been carried out in the feeding of animals, and the knowledge of the country is quite accurate and extensive on this subject. As regards practical breeding, however, our knowledge has advanced very little during the past thirty years. If America would be a breeding ground, and not a country of feeding and trading operations, dependent on others, these problems must be taken up. Increasing the fertility of hogs, breeding disease-resistant strains, breeding for increased yields of milk, butter, wool, meat, and work, are among the subjects which may be studied to the increase of the wealth of the nation.

The Department has no desire to injure any honest breeder or importer; it does not seek to promote the interest of any particular breed above others, nor have its plans been drawn up with the idea of displacing any breed already established. Those problems are being attacked which seem most urgent and whose solution will have the most far-reaching effect on breeding interests.